Introduction

Cleaning and shaping of root canal is one of the important steps in root canal therapy for elimination of infection by removal of vital and necrotic tissues from the root canal system, along with infected root dentine .Earlier cleaning and shaping was done using stainless steel files. They cause procedural errors such as ledges, zipping and perforations. To overcome this disadvantage nickel titanium files were introduced. Nickel Titanium contains 55 wt% Nickel and 45 wt% Titanium, less than 2wt% Cobalt. NiTi alloys are softer than Stainless steel and have a low modulus of elasticity but a greater strength, tougher and more resilient and show shape memory and superelasticity. The main disadvantages of NiTi instruments are cyclic fatigue and torsional loading. Fracture of NiTi instruments occurs in two different ways - torsional fracture and fracture by flexural fatigue. Torsional fracture occurs when the instrument tip is locked in canal but the shank continues to rotate. Fracture caused by fatigue occurs because of metal fatigue. The instrument does not bind in the canal but rotates freely in a curvature and generates tension/compression cycles at the point of maximum flexure.

Aims and Objectives:

To comparatively evaluate the cyclic fatigue resistance of two heat treated rotary files – FlexiCON X_3, Twisted files and two heat treated reciprocating files – FlexiCON X_1, Wave one. To evaluate whether rotary or reciprocating files have more cyclic fatigue resistance. To evaluate whether annealed heat treated or thermomechanically heat treated files have more cyclic fatigue resistance.

Methodology:

Twenty new files each of WaveOne, FlexiCON X_3, Twisted files and FlexiCON X_1 was selected for the study. The files were evaluated under stereomicroscope at 20x

magnification for any cracks or defects. Files with no surface defects or cracks was selected for the study. Cyclic fatigue testing of endodontic files was done on the artificially duplicated tempered steel canal which was mounted on a framework made of iron and wood to which the support for hand piece was attached. The artificial canal system was made of tempered steel. The canal system, which comprises two adjustable stainless steel blocks will have a 3 mm width, 60° angle of curvature and 5 mm radius. All the files in each group were rotated according to the manufacturer's instruction. All the files were rotated until fracture occurs. The time till fracture in seconds was recorded using a stop watch. The number of cycles to fracture (NCF) which is indicative of cyclic fatigue resistance was calculated by multiplying the time (seconds) to fracture by the number of rpm regardless of rotational direction.

Results:

In all the four groups Wave One files showed better cyclic fatigue resistance than FlexiCON X1, FlexiCON X3 and Twisted Files.

Conclusion:

The results showed that reciprocating files showed better cyclic fatigue resistance than rotating files. Thermomechanically heat treated files showed better cyclic fatigue resistance than Annealed heat treated files in reciprocating motion and Annealed heat treated files showed better cyclic fatigue resistance than Thermomechanically heat treated files in rotating motion.

Clinical implication

As fracture of endodontic file is a significant challenge to clinical endodontic practice, this study helps us to realize that reciprocating files and heat treated files can improve the fracture resistance of the file.